A Report on the Cases of Acute Poliomyelitis treated in the Northern Ireland Fever Hospital

in 1952

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In the year ending on the 31st December, 1952, there were one hundred and twelve cases of acute poliomyelitis admitted to the Northern Ireland Fever Hospital. One hundred and eleven patients were admitted as suspected cases of poliomyelitis. Of these the diagnosis was correct in seventy-one. In the forty in whom the diagnosis was not confirmed no distinctive condition could be found in twenty-three. Tonsillitis was present in four and pneumonia in three, and there was one case each of meningitis, Flexner dysentery, influenza, scurvy, transverse myelitis, Guillain-Barré syndrome, lumbago, mumps, anæmia, and acidosis. Among patients admitted for other conditions forty-one were found suffering from poliomyelitis. They had been described before admission as meningitis (37 cases) and as dysentery, scarlatina, typhoid, and pyrexia of unknown origin (1 case each).

The seasonal incidence of the infection is shown in the following table.

TABLE 1.

1952	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
No. of cases	7	. 16 .	72	17

Children were mainly affected, the highest incidence occurring in the 5-10 year group, as shown in Table 2. Before 1947 the maximal incidence was in the under fives (Harries and Mitman, 1951). The higher age incidence now seen has been explained by Horton and Rubenstein (1948), who state that the change is due to alteration in the age distribution of the population, as well as to increased accuracy in the diagnosis of non-paralytic poliomyelitis.

TABLE 2.

Age in years	. Un	der 1	year.	1-4	5-9	10-14	15-24	25 +	Total
1952		3		20	 37	 13	 24	 15	 112

Of the one hundred and twelve cases admitted, sixty-two were non-paralytic, forty-five were paralytic, and five had polio encephalitis. In the non-paralytic cases the disease varied from a mild systemic upset where headache lasting one hour or more was the only symptom to the full blown meningeal syndrome.

The forty-five paralytic cases can be sub-divided according to the part of the central nervous system affected (Table 3), but no classification can be adequate because of the overlapping in each group.

TABLE 3.

C.N.S.					No. of cases
Cranial Ne	erves	_	-	-	14
Spinal	-	-	-	-	31
Total	-	-	-	-	45

The majority of patients admitted had symptoms of fever, malaise, headache, irritability, photophobia, muscle pains and meningism. Eight cases had symptoms of upper respiratory tract infection, and eleven had gastro-intestinal disturbances. The abdominal symptoms might be explained by a virus infection of the abdominal glands. Where there was spinal paralysis the legs were twice as commonly affected as were the arms, the extensor muscles of the foot, and the muscles of the shoulder girdle bearing the brunt of the disease. Respiratory paralysis remains the most dreaded complication of poliomyelitis. Six cases with respiratory paralysis required artificial respiration, and of these, three died. The survivors who are still in hospital are males aged 4, 8, and 28 years. All three survivors had extensive spinal paralysis but no bulbar involvement. The youngest, aged 4 years, had artificial respiration for one week because of intercostal and diaphragmatic weakness. The other child had gross intercostal involvement, but the diaphragm was intact and artificial respiration was required for only nine days. The adult, however, had almost complete paralysis of intercostals and diaphragm. His respiratory embarrassment was further complicated in the first few days by abdominal distension which resisted all treatment. Continuous artificial respiration was required for six weeks. He was then gradually weaned from the mechanical lung until at the end of eight months he could do without artificial aid.

Involvement of the cranial nerve nuclei is relatively common in acute poliomyelitis, that of the seventh nerve being most frequently affected. In this series isolated facial nerve palsies were seen in seven cases. Three patients showed complete recovery and the remainder were improved. When the upper cranial nerves are involved there is no threat to life, although residual paralysis may be a permanent handicap. With bulbar involvement the outlook is much more serious and interference with swallowing may result in asphyxia or aspiration bronchopneumonia. Patients may present with hoarseness, nasal speech, inability to swallow and regurgitation of fluids. One of our patients, a boy aged 4 years, had paralysis affecting the fifth, seventh, tenth, eleventh, and twelfth cranial nerves. The fifth nerve palsy was bilateral, affecting both masseters, though internal pterygoid movement was normal. Recovery was complete except for a slight left facial weakness. Another patient, aged 33 years, with an extensive spinal paralysis had an associated bilateral masseter palsy. She was unable to eat and the mouth remained open, drooling saliva. Recovery was almost complete after eight weeks.

Five cases were diagnosed as polio-encephalitis. Two were children under six years and three were adults. Four patients presented with general encephalitic manifestations and complained of constant headache which was associated with restlessness, drowsiness, and disorientation. Focal lesions were present in two

cases. One was a boy of 18 years who developed an immobile palate; the other, a child of $2\frac{1}{2}$ years, deserves more detailed mention. She was admitted in a stuperose condition with twitchings of the right face and arm, but no obvious muscular weakness. Her condition remained unchanged for five days, and it was not until the level of consciousness had improved that a right facial palsy was noted. She appeared to see and hear but did not, or could not, speak, and was reluctant to use the right arm. Final evaluation revealed hyperactivity, emotional instability, aphasia, and athetosis of the right hand. E.E.G. revealed a generally abnormal pattern. One of the adults mentioned experienced a slow recovery, passing from the stuperose state to one of mental instability and irrationality which lasted for the most of six weeks.

CAUSE OF DEATH.

Of the one hundred and twelve patients admitted three died, and in all death was due to bulbar involvement following extensive and progressive paralysis.

Their case histories are as follows:—

Case 1.—A male aged 27 years who was admitted on the fourth day of an illness in which severe headache was the predominant feature. He was restless, dyspnœic, and cyanosed. Respiratory movements were minimal and there was complete paralysis of all limbs. The upper respiratory passages were cleared of mucus by suction, and artificial respiration instituted immediately while oxygen was administered by nasal catheter. The paralysis continued to spread, involving the muscles of deglutition and probably the medullary centres. Death occurred fifteen hours after admission.

Case 2.—A female aged 7 years who was said to have had an attack of scarlatina fever three days prior to admission. She exhibited meningism but had no muscle weakness until her third day in hospital when paralysis involving both lower limbs, intercostals and deglutition became evident. Artificial respiration was begun and aureomycin given prophylactically. Oxygenation appeared satisfactory but she suddenly collapsed, and died on the fourth day in hospital. Death was probably due to respiratory failure and severe circulatory collapse.

Case 3.—A male aged 4 years, who was admitted on the second day of illness. He had an extensive paralysis affecting arms, legs, diaphragm, and abdominal musculature. Artificial respiration, postural drainage and suction were begun immediately, but the oxygenation remained poor. Finally, as the medullary centres became affected, respirations became shallow, irregular, and gasping. Death occurred forty-six hours after admission.

Diagnosis.

The diagnosis was established by clinical examination and lumbar puncture. When there was obvious flaccid paralysis no difficulty was encountered, but when only meningism was exhibited, several diagnoses had to be considered.

On admission to this hospital each patient is subjected to a routine lumbar puncture. At the same time a sample of blood is taken for blood sugar estimation, and a Mantoux 1/1000 skin test inserted. Normal readings for the cerebro-spinal fluid are taken as protein under 40 milligrams; white cells under 10; and sugar of more than 40 milligrams. In most cases of poliomyelitis the cerebro-spinal fluid is clear, under increased pressure, with a white cell count of between 20 and 250 per millilitre, and an accompanying rise in protein. The cells are mainly lymphocytes, and when these exceed 200 per millilitre the fluid becomes steamy.

Occasionally the cell count may reach a very high level. The cerebro-spinal fluid in tuberculous meningitis reveals a low sugar, with a marked increase in white cells and protein, the cells being predominantly lymphocytic. The blood sugar is valuable for comparison with that of the cerebro-spinal fluid. A positive Mantoux reaction, especially in a child, aids the diagnosis of tuberculous meningitis.

It is widely accepted that a polymorphonuclear leucocytosis occurs in the cerebrospinal fluid in the early stages of acute poliomyelitis. The findings in this series are noteworthy. Sixty-seven cases were admitted on and before the fourth day of illness, and of these, only six presented this feature with polymorphonuclears varying between 10 and 90 per cent. Seven other cases admitted between the sixth and fifteenth day of illness showed a similar polymorphonuclear count varying between 20 and 60 per cent. Only ten of the one hundred and twelve cases admitted had normal cerebro-spinal fluids.

An abnormal cerebro-spinal fluid may be found in various other virus infections. A history of contact or recent infection with measles, varicella, pertussis, or mumps may help. This was so in four of our cases where the infecting agent was the mumps virus. All had clear cerebro-spinal fluids, with a lymphocytic pleocytosis, raised protein and a normal sugar. Another child, aged five years, gave no such history but complement fixation tests for mumps virus were positive to high titre in all five.

In most of those cases where there was an altered cerebro-spinal fluid and no paralysis, two specimens of blood were taken for serological examination. The first sample was taken during the first week of illness, and the second, after the twenty-first day. Leptospiral agglutination tests and complement fixation tests for the viruses of lymphocytic chorio-meningitis and mumps were carried out by the Virus Reference Laboratory, Colindale. Paul-Bunnell tests were done on 23 patients—none was positive. Six other patients returned a titre for mumps which suggested a recent infection with the virus. No history of contact or infection could be obtained, and these are still included in the list as non-paralytic poliomyelitis.

In the differential diagnosis interesting cases rejected were:—

Case 1.—A Guillain-Barré syndrome. The patient was a boy aged 7 years who developed a symmetrical flaccid paralysis of all limbs and weakness of the trunk musculature without any initial meningeal signs. The deep reflexes were absent. Examination of the cerebro-spinal fluid showed a cell-protein dissociation. Recovery was progressing satisfactorily when he was removed from hospital six weeks after admission.

Case 2.—A female child of six months who was admitted as a case of poliomyelitis and subsequently diagnosed as suffering from scurvy. On examination no obvious scorbutic lesions were present. The right leg was abducted and exhibited pseudoparalysis. The only positive finding was an acutely tender area over the medial tibial condyle. Diagnosis was established by X-ray, which showed a zone of rarefaction and destruction in the metaphyseal area with elevated periosteum. A sample of blood taken at this time revealed a low vitamin C level. Recovery was complete on an adequate diet.

TREATMENT.

Treatment of our patients has been along well recognised lines, the object being to produce mental and physical rest. This is achieved by adequate sedation, and, when there is paralysis, the affected parts are splinted to prevent deformity. Physiotherapy is commenced when muscle tenderness has abated.

Non-paralytics are detained in hospital for three to four weeks or until the cerebro-spinal fluid has returned to normal.

Six cases requiring artificial respiration were nursed in Both respirators. In addition, four of these required oxygen, and this was given by nasal catheter. Nutrition is maintained in the acute stage by small fluid feeds. If the patient can swallow comfortably these are given by mouth, if not, the nasal route is used.

Antibiotics are not prescribed routinely but are only given in those cases where there is clinical evidence of respiratory infection or as prophylaxis in special cases. With recovery of respiratory musculature, the patient may be removed from the respirator for a longer period each day. Where there is bulbar involvement the major problems are:—

- 1. Difficulty in maintaining an airway, and
- 2. Difficulty in feeding.

Here the patient is unable to handle his secretions. Saliva and mucus accumulate in the pharynx, and an adequate airway is only maintained by postural drainage and continuous suction. Again, oxygen is often necessary. Fluids may have to be given by intravenous sub-cutaneous or nasal routes, because of inability to swallow.

The place of tracheotomy in the treatment of respiratory and bulbar paralysis has not yet been decided. In the past three years, using the Both respirator with suction apparatus and postural drainage, our mortality rate has been 39 per cent. This is comparable with the recent figure of 40 per cent. issued from Copenhagen in the 1952 epidemic, where tracheotomy was combined with artificial respiration carried out by manual bag compression.

Retention of urine is not uncommon, but being only a temporary embarrassment, is treated with intramuscular carbachol in preference to repeated catheterisation. Prostigmine and pituitrin are given when abdominal distension is troublesome.

COMPLICATIONS.

Patients who have had intercostal and diaphragmatic paralysis are unable to combat any respiratory infection. Bronchitis and broncho-pneumonia occur frequently and may terminate fatally, despite the administration of antibiotics and renewed artificial respiration. Visitors to these wards are not encouraged during the season of respiratory infections. Abdominal distension was present in only one patient who was under treatment in the Both respirator.

Less serious complications are those due to over-activity of the sympathetic nervous system. Retention of urine and abdominal distension occur in the early phase of the disease and are temporary. In this series retention of urine was not confined to those cases with extensive spinal paralysis, but occurred also in an adult male suffering from polio-encephalitis.

Skeletal deformities are prone to occur but are minimised by adequate physiotherapy. Poor circulation is a common finding in paralysed limbs.

Prognosis.

The prodromal illness seems to bear no relationship to the severity of the ensuing paralysis. When the latter does occur it is impossible to forecast with accuracy the extent of muscle recovery.

A combination of bulbar and spinal paralysis constitutes the major cause of death. It has been noticed that when bulbar paralysis occurs alone without involvement of the autonomic centres, prognosis is good if a clear airway can be maintained. All patients with palatal and pharyngeal paralysis made a good recovery.

When there is primary involvement of the respiratory and vasomotor centres death usually occurs in the first few days of illness. With respiratory paralysis of spinal origin the immediate outlook is rather better but remote prognosis is poor because of inadequate recovery of the respiratory musculature. Ventilation may be sufficient for basal requirements but repeated respiratory infections may cause death or confine the patient to the precincts of a hospital for the remainder of his days.

SUMMARY.

In the year ending on the 31st December, 1952, one hundred and twelve cases of poliomyelitis were admitted to the Northern Ireland Fever Hospital. Of these, sixty-two were non-paralytic, forty-five were paralytic, and five had polioencephalitis. The symptomatology, age incidence, and seasonal incidence of this series are similar to those reported elsewhere.

Ten cases had normal cerebro-spinal fluids. Those who had abnormal cerebro-spinal fluids and were without paralysis were subjected to further agglutination and complement-fixation tests before being listed under the heading of non-paralytic poliomyelitis.

The value of tracheotomy in the treatment of bulbar poliomyelitis has not yet been decided.

There were three deaths due to bulbar involvement following progressive and widespread paralysis. Eighteen cases remained in hospital at the end of the year.

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